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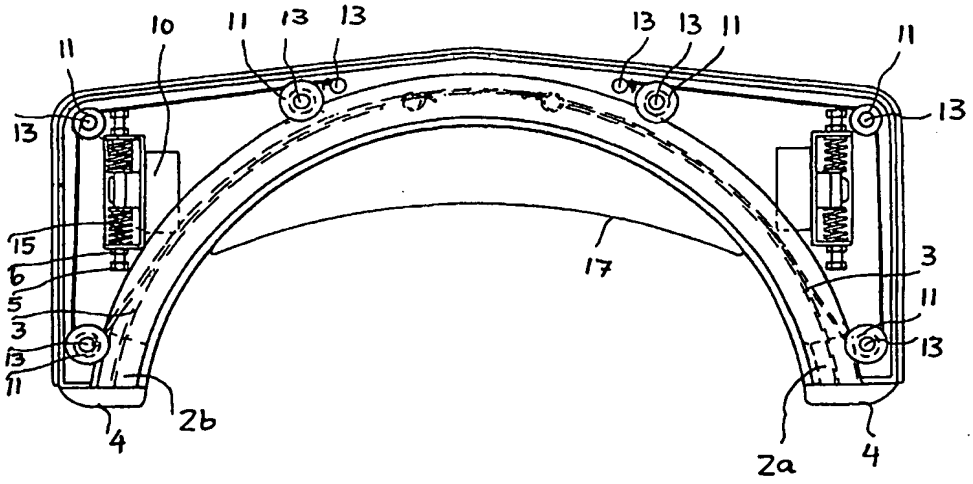

(57) Abstract

A safety device for attachment to a seat in a vehicle for restricting the movement of a person's head relative to a vehicle on extreme acceleration or retardation as a result of a crash impact, comprising a netting (3) or the like, which on release can be deployed rapidly in front of the person's head, wherein the netting (3) in a first position, the pre–operative position, is located behind the seat occupant, and in a second position is located in front of the head of the seat occupant.

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SECURITY SYSTEM FOR A VEHICLE

The present invention relates to a motor vehicle safety system, in particular a safety system which protects against whiplash injuries.

Motoring injuries are a major and growing problem with today's ever-increasing traffic. Whiplash injuries seem to be on the increase more than other types of motoring injuries, and this may be due to the extensive use of car seat belts.

In a collision from behind, the car and thus the car occupant's body, experiences an increase in speed forward, whilst the head continues at the same speed. The effect of this is that the head is flung against the headrest which only in exceptional cases is in contact with the head when driving is in progress, whereupon a first injury occurs due to the head being flung back in this way.

The car occupant's head is then thrown forward whilst the upper part of the body is restrained by the seat belt. Thus, the neck is subjected to a sudden flexural stress which may result in another injury in the neck region.

These whiplash injuries are a major problem both for the individual and for society. The individual suffers a lot of pain and often loss or reduction of capacity to work. For society, this causes loss in the form of an additional strain on the health service and loss of earnings. For the insurance companies, whiplash injuries mean enormous losses in the form of compensation and so forth.

Despite intense research into car safety and the introduction of safety belts and airbags, no equipment has been developed for the prevention of whiplash injuries. Airbags have gradually become quite common, especially in new cars, but this equipment does not provide adequate protection against whiplash injuries.

Certain other vehicle safety systems have also been developed, which for various reasons have not become common in cars. For example, US Patent 4,909,459 teaches a helmet-mounted head restraint, intended chiefly for use in aeroplanes. The device is rather unsuitable for a car as there are few people who drive wearing a helmet.

Moreover, certain systems involving inflatable devices are known. For example, reference can be made to US Patent 3,779,577 which relates to an installation having

two airbags, one in front and one behind the headrest of the front seat, which in the event of a collision are inflated and are able to protect the driver's head from injurious impact against the headrest, and can also prevent a back-seat passenger from injuring himself on the back of the front seat.

US Patent 3,753,576 and US Patent 3,953,049 both teach hoop devices for supporting and/or conveying an inflatable member which according to need is triggered by a sensor, is inflated and prevents the vehicle occupant's body and/or head from being flung forward.

Solutions are also known where a shield, net or the like which in normal conditions is positioned above the head of the driver and/or passenger, and which upon collision is released, pulled down in front of the person and embraces the head and upper part of the person's body. Of the devices of this type mention can be made of US Patent 5,226,672, where a net, which is normally stowed in the vehicle roof above the person's head, in the event of a collision is drawn down and back by a number of cords which are pulled by suitable quick-action drive mechanisms.

DE 2601314 A1, DE 3636040 A1 and US Patent 3692327 all teach devices where hoops with a shield, respectively a net, are extended down in front of the head and upper part of the vehicle occupant's body in the event of a collision. Common to all these hoop-based systems is that the devices are large and bulky, and difficult to incorporate in an acceptable manner into a vehicle, especially when mounted subsequent to the vehicle being built.

Norwegian Patent Application No. 942861 relates to a headrest containing a net drawn out by telescopic release bars. This net is soft and cannot give the seat occupant any protection other than to catch his head and prevent it from being thrown forward in the event of a crash impact from behind.

Thus, there is a need for a safety device which in the event of a crash impact from behind both catches the head and at the same time provides the head with a solid shell for protection against the steering wheel, dashboard and so forth.

According to the present invention, this is achieved by means of a safety device for attachment to a seat in a vehicle for restricting the movement of a person's head relative to the vehicle on extreme acceleration or retardation as a result of the crash impact,

comprising a netting (3) or the like, which on release can be rapidly deployed in front of the person's head, where the netting (3) in its first position, the pre-operative position, is stowed in a headrest behind the head of the seat occupant, and in a second position is located in front of the seat occupant's head.

The drawbacks of the aforementioned devices have now been overcome by means of the present invention.

With the present device, the vehicle occupant will not be hampered by the safety device during normal driving, but will be protected effectively against the injuries which may occur in the event of a crash impact from behind.

The present invention will now be described with reference to the attached drawings, wherein:

Figure 1 is a frontal view of one embodiment;

Figure 2 is a bird's eye view of the same embodiment as in Figure 1, in the released position;

Figure 3 is a lateral view of the same embodiment as in Figure 1;

Figure 4 is a lateral view of a partial section of the same embodiment as in Figure 1;

Figure 5 shows the section A-A in Figure 1;

Figure 6 is a frontal view of the same embodiment as in Figure 1 in a released state;

Figure 7 illustrates the same embodiment as in Figure 1, retained by means of elastic stays.

The safety device in the illustrated embodiments is constructed in the form of a headrest which can be secured to the standard attachment means of a seat back with the aid of bars 16. The illustrated headrest is indicated by an outer shell 1, in which there are provided hoops (2), which in the pre-operative position are drawn inside the headrest,

but which in the released position swing out therefrom. Four hoops (2) are provided in the device, two on each side of the device, one in the upper edge and one in the lower edge, which in the pre-operative position lie inside the device, but which when the device is released, can be pushed outward and forward, so that the hoops (2), which are curved, form a ring forward of the device, one ring at the top of the device and one ring at the bottom thereof, in front of the head of the seat occupant.

Forward pieces (4) on each side of the device extend between the upper and lower hoops (2) on each side. The forward pieces (4) are preferably padded in order to avoid injury on impact of the forward pieces (4) against the seat occupant's head and face. Moreover, the distance between the hoops (2) is defined by the length of the forward pieces (4). Between the upper and the lower hoops (2) on each side there extends a netting (3) which is connected to the hoops (2). In the pre-operative position the hoops are located in the headrest, pre-tensioned by means of an elastic body (7), such as, e.g., an elastic band, and in this position they are locked by a locking dog (8) which is attached to an inertia release device (10).

The release mechanism in this illustrated embodiment is an inertia release device which is based on the inertia in a weight provided at one end of an arm (18) which is pivotally mounted about an axis (19) on a bracket (20). In the illustrated embodiment a spring (15) is provided to hold the weight (10) in its fixed position. A locking arm (21) projects approximately perpendicular to the arm (18), preferably close to the shaft (19). On the locking arm (21) at the outer end thereof there is provided a locking pin (8) which is engaged with a projection (9) on the hoop (2), and prevents this from swinging outward and forward from the headrest.

In the event of substantial acceleration or retardation, the inertia of the weight (10) causes the weight to swing forward and backward and thus draw the locking pin out of engagement with the projection (9). The hoops (2) will thus be released from lock, and will be brought forward and out of the head rest by means of the elastic bodies (7). In the device shown in the figures, a release means is provided on either side of the headrest, i.e. one release means for each pair of hoops. However, the release devices may be connected, or other types of release devices may be used to ensure a simultaneous release on both sides of the headrest.

On release, the hoops (2) are pulled forward and retained in this position after release by an elastic body (7), preferably an elastic band. This elastic body can, as shown in Fig. 5, run over several rollers (11).

Inside the outer shell (1), the illustrated headrest has an inner shell (12) which can be drawn out by the inner shell when it is subjected to a sufficiently large load. The inner shell (12) is attached to a point of attachment in the outer shell (1) by means of two or more straps (14). These straps are preferably elastic and are of limited extendibility. In the event of a crash impact from behind, the device will thus be released so that the person's head is held by the hoops and the net which are swung forward in front of the head. When the head is then flung forward, the inner shell and the hoops accompany the head, and the head experiences a gentle, controlled retardation with the aid of the straps (14) with their limited extendibility and concomitant incorporated elasticity. The limits or prevents neck injuries.

After use, the inner shell can be pushed back inside the outer shell, the hoops (2) with netting (3) can be reinserted inside the headrest, and the device is once more ready for use.

In order to soften blows to the head caused by impact with the headrest, there is preferably incorporated into the headrest a resilient and preferably inflatable cushion (17). In the event of a collision which releases the device, the head is pressed back against this cushion, compressing it whilst the hoops (2) are swung forward. When the pressure of the head against the cushion ceases, this again expands and helps to hold the head in place in the device.

There are other forms of mounting the present safety device: the inner shell may be mounted directly, for example, on another headrest, seat back or the like, and can be detachable from this base with the same types of straps as shown in the device having in an inner and an outer shell, to check the movement of the head forward in a manner which will cause minimum injury.

In the case of cars with automatic seat belt tensioner, this detachment and/or the inner and outer shell which can be drawn apart are omitted.

Patent claims

1.
A safety device for attachment to a seat in a vehicle for restricting the movement of a person's head relative to a vehicle on extreme acceleration or retardation as a result of a crash impact, comprising a netting (3) or the like, which on release can be deployed rapidly in front of the person's head, characterised in that the netting (3) in a first position, the pre-operative position, is stowed in a headrest behind the seat occupant, and in a second position is located in front of the head of the seat occupant.

2.
A safety device according to Claim 1, characterised in that the netting (3) is secured to hoops (2), one in the upper edge and one in the lower edge of the netting.

3.
A safety device according to Claim 2, characterised in that it comprises two sets of preferably curved hoops (2), one set of each side of the device, and which on release of the hoops (2) are swung forward on each side of and in front of the head of the seat occupant.

4.
A safety device according to one or more of the preceding claims, characterised in that the headrest is a separate headrest secured to the back of the seat.

5.
A safety device according to one or more of the preceding claims, characterised in that the headrest is in the form of an integral part of the seat back.

6.
A safety device, according to one or more of the preceding claims, characterised in that the device comprises an inner part and an outer part, wherein the outer part is secured to the seat back, and wherein the inner part is detachably secured in the outer part and can be detached therefrom.

7.

A safety device according to Claim 5, characterised in that the inner and outer parts are connected with preferably elastic cords for retaining the inner part.

8.

A safety device according to one or more of the preceding claims, characterised in that in the headrest there is incorporated a resilient and optionally inflatable cushion (7) which helps to hold the head in position in the released device.

AMENDED CLAIMS
[received by the International Bureau on 30 April 1998 (30.04.98);
original claims 1-8 replaced by amended claims 1-5 (1 page)]

1.

A safety device for attachment to a seat in a vehicle for restricting the movement of a person's head relative to a vehicle on extreme acceleration or retardation as a result of a crash impact, comprising a netting (3) or the like, which on release can be deployed rapidly in front of the person's head, where the netting (3) in a first position, the pre-operative position, is stowed in a headrest behind the seat occupant, and in a second position is located in front of the head of the seat occupant, characterised in that the netting (3) is secured to hoops (2), one in the upper edge and one in the lower edge of the netting.

2.

A safety device according to Claim 1, characterised in that it comprises two sets of preferably curved hoops (2), one set of each side of the device, and which on release of the hoops (2) are swung forward on each side of and in front of the head of the seat occupant.

3.

A safety device, according to one or more of the preceding claims, characterised in that the device comprises an inner part and an outer part, wherein the outer part is secured to the seat back, and wherein the inner part is detachably secured in the outer part and can be detached therefrom.

4.

A safety device according to Claim 5, characterised in that the inner and outer parts are connected with preferably elastic cords for retaining the inner part.

5.

A safety device according to one or more of the preceding claims, characterised in that in the headrest there is incorporated a resilient and optionally inflatable cushion (7) which helps to hold the head in position in the released device.

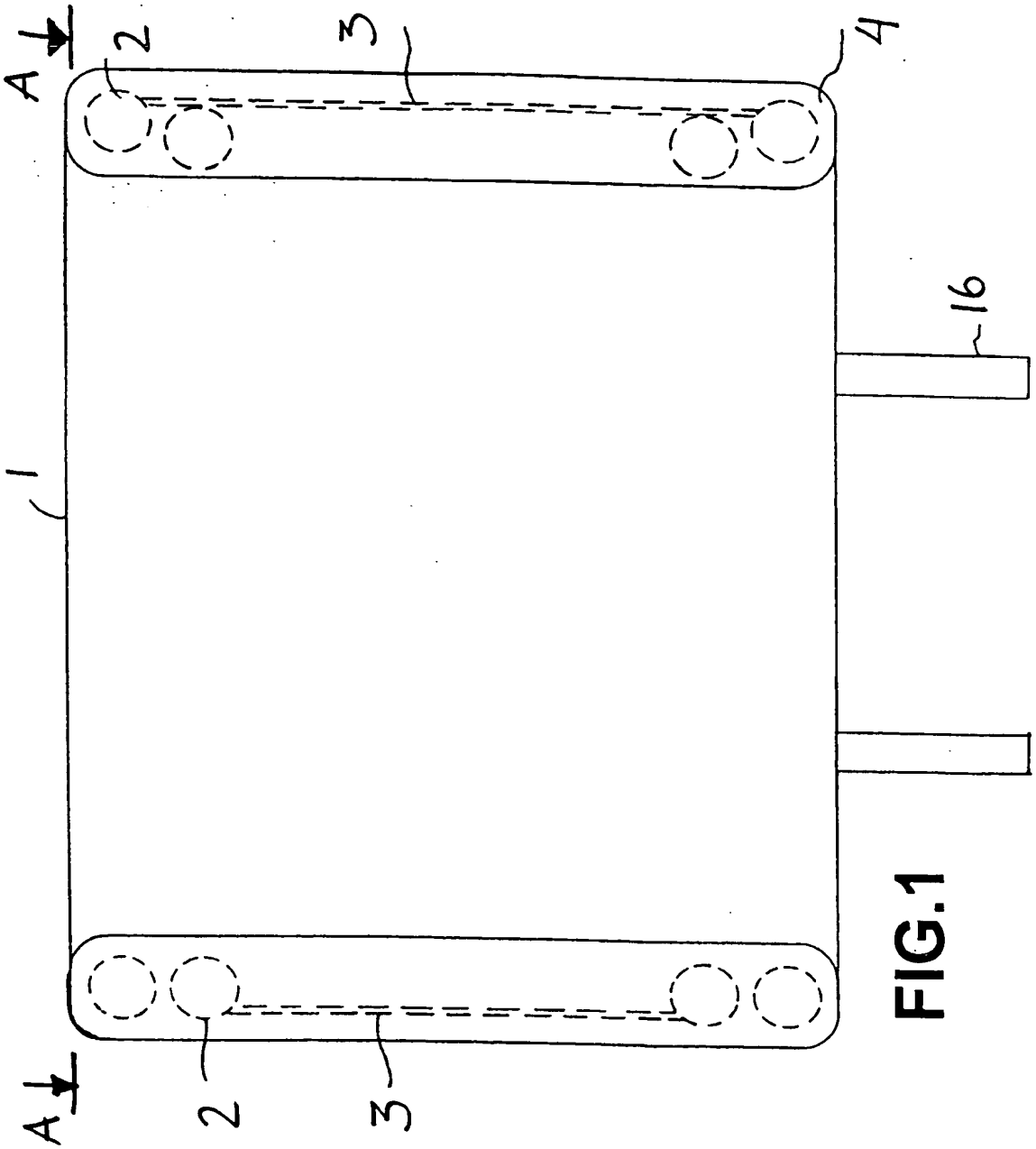

FIG.1

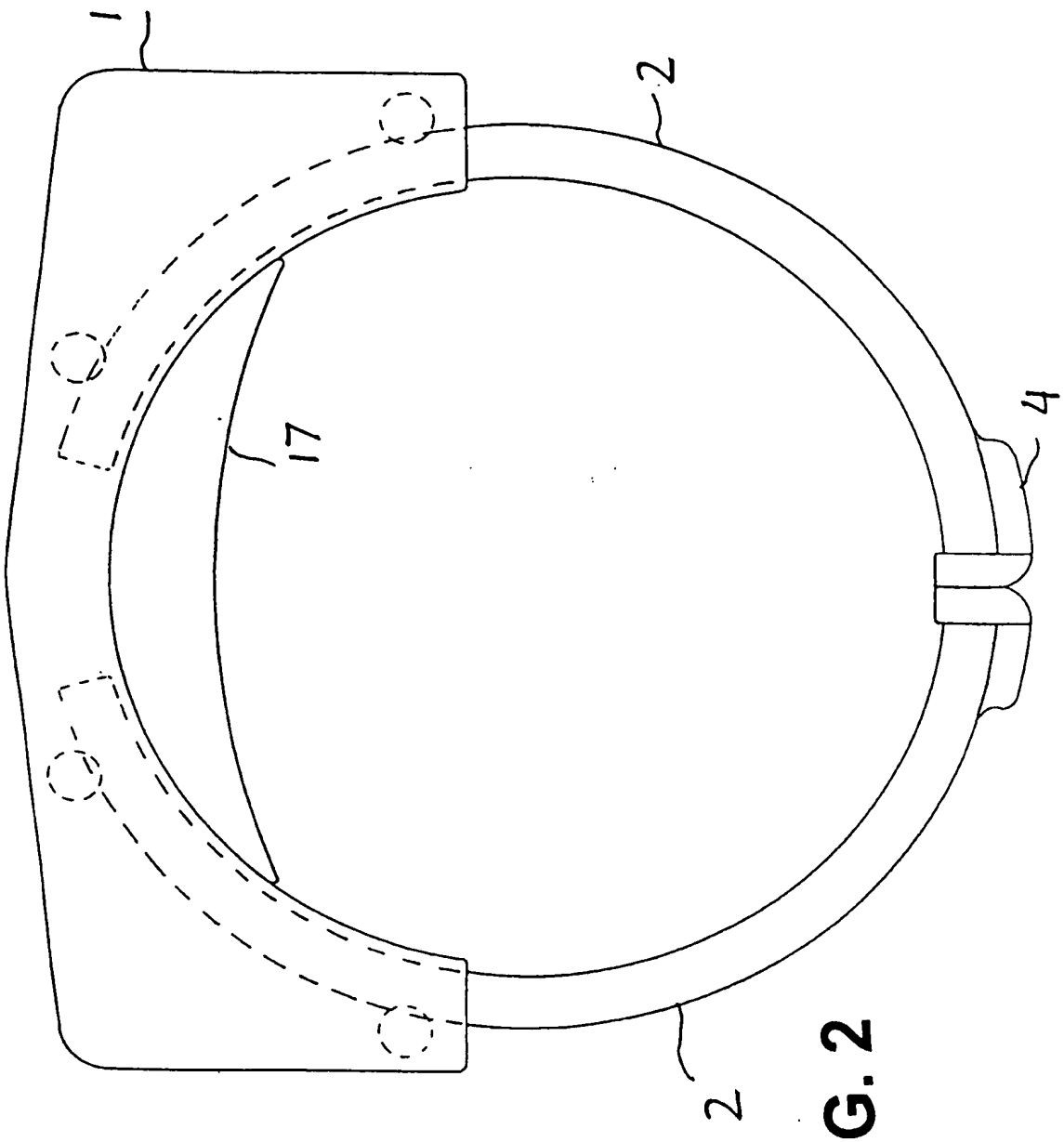

FIG. 2

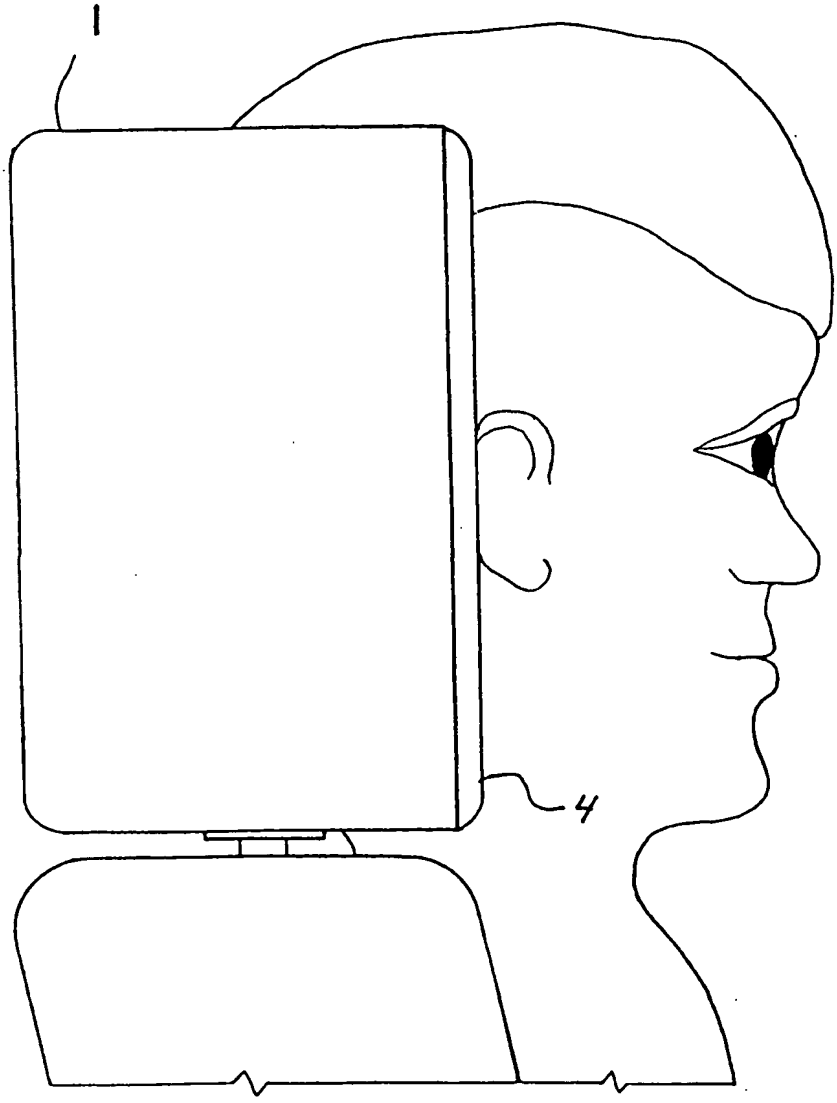

FIG. 3

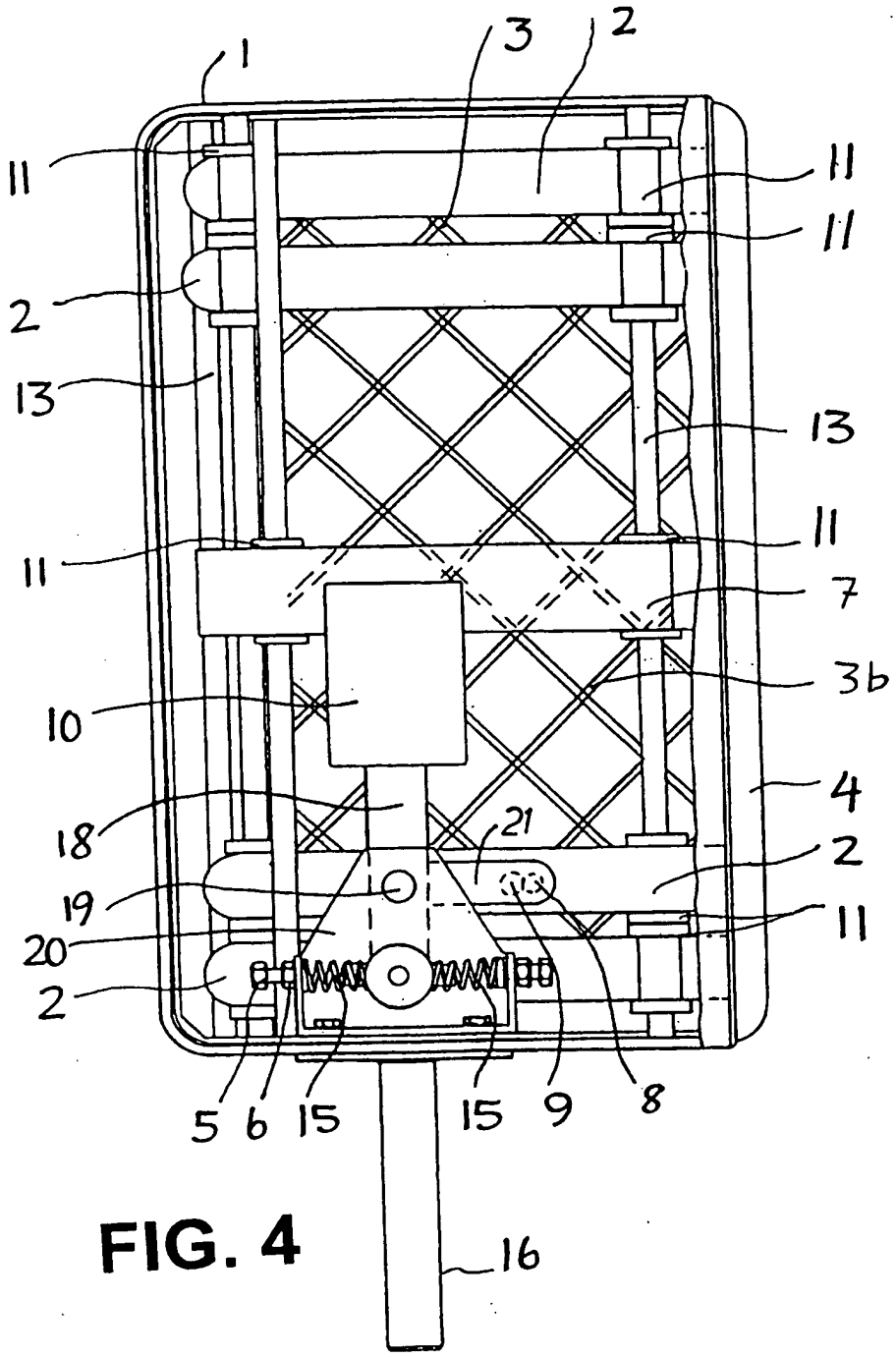

FIG. 4

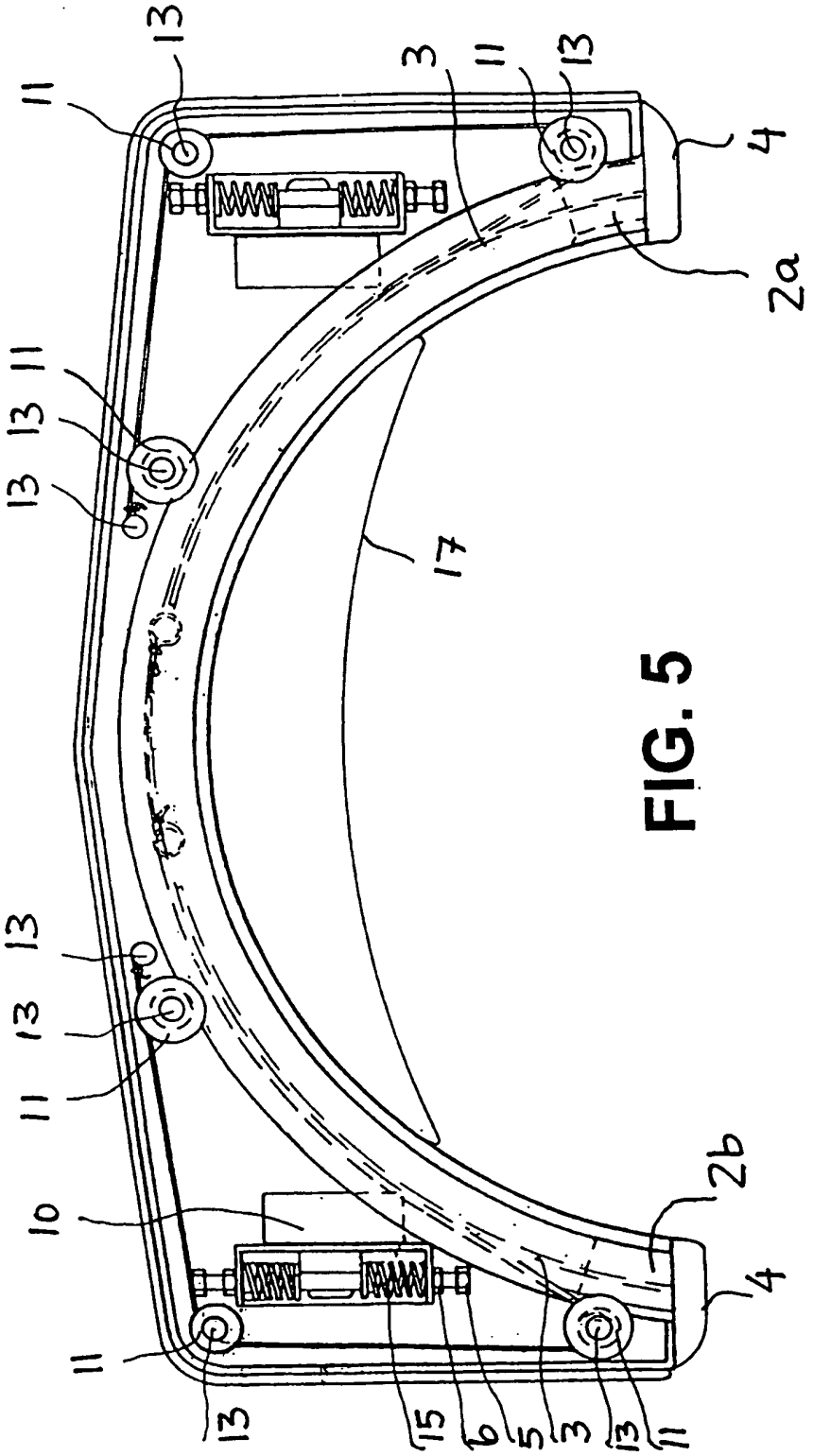

FIG. 5

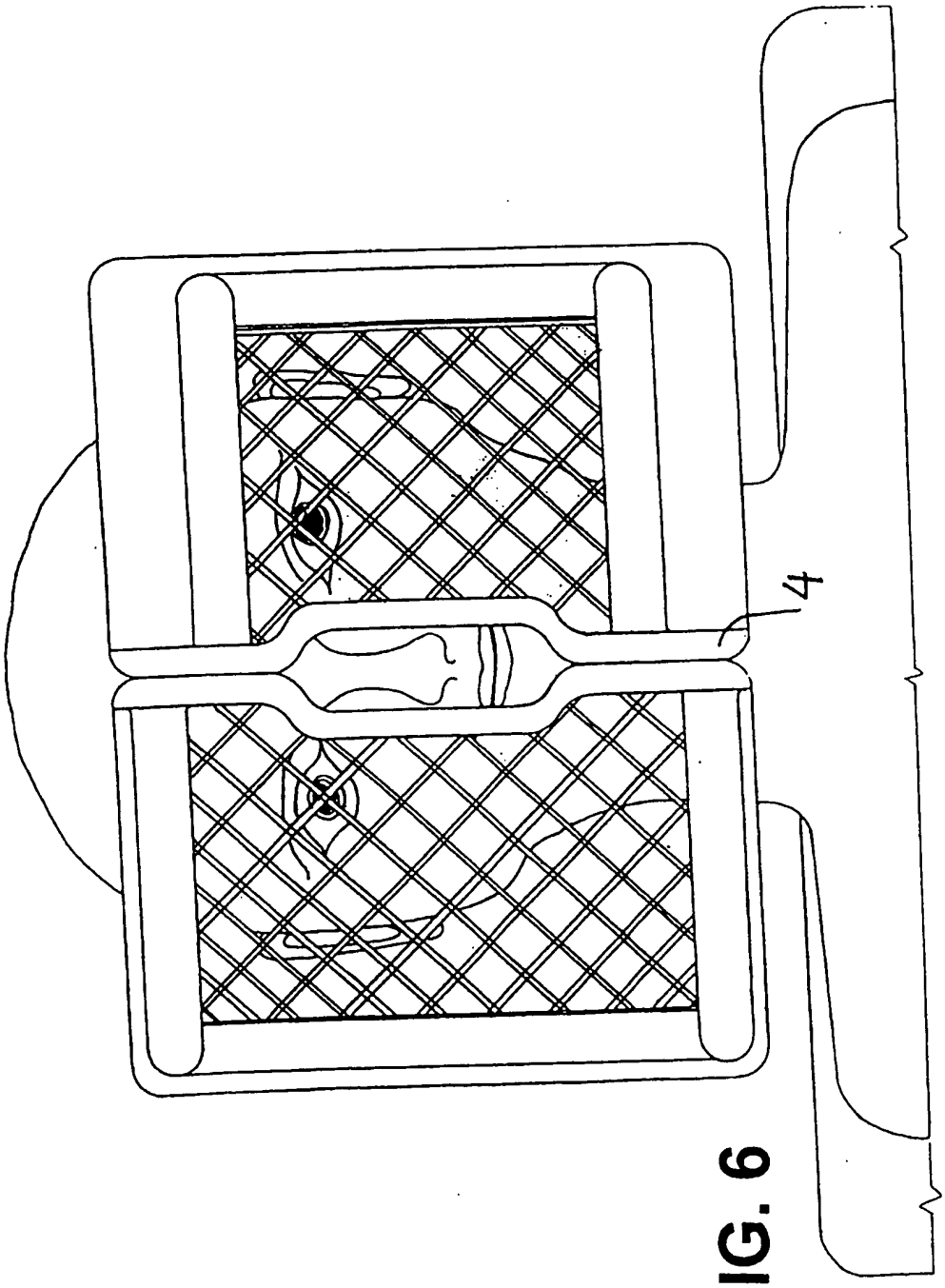

FIG. 6

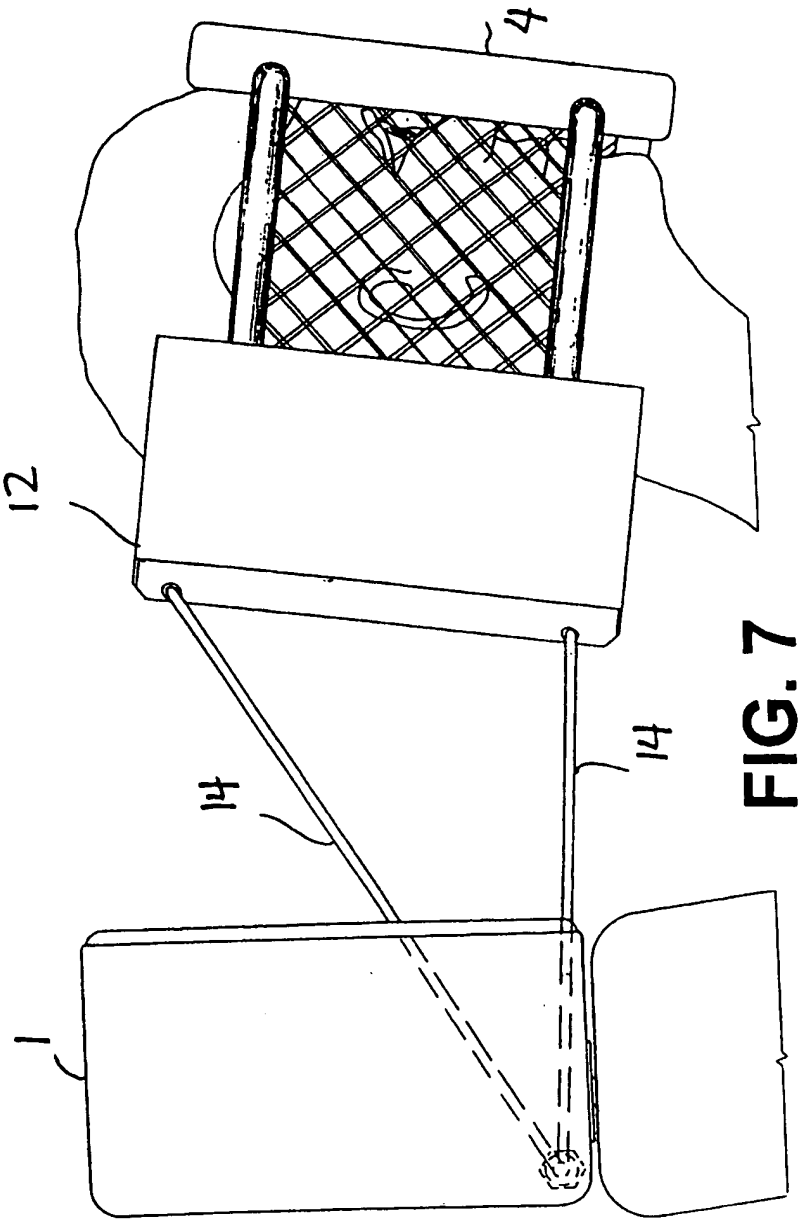

FIG. 7

INTERNATIONAL SEARCH REPORT

International application No.
PCT/NO 97/00320

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B60N 2/48, B60R 21/08
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B60N, B60R, B64D

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 29602177 U1 (EGER, WILHELM), 29 August 1996 (29.08.96), page 1, line 1 - page 2, line 22, figures 1,2,3	1,4,5
Y		6,7
A		2,3,8
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X	NO 301413 B1 (JACOB KALLEBERG), 5 February 1996 (05.02.96), figures 4,10, abstract	1,4,5
A		2,3,6,7,8
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Y	US 4909459 A (PATTERSON), 20 March 1990 (20.03.90), figure 1, abstract	6,7
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Date of the actual completion of the international search	Date of mailing of the international search report
24 March 1998	24 -03- 1998
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INTERNATIONAL SEARCH REPORT

International application No.
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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3953049 A (SURACE ET AL), 27 April 1976 (27.04.76) --	1-8
A	US 3922034 A (EGGERT), 25 November 1975 (25.11.75) --	1-8

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/03/98

International application No.
PCT/NO 97/00320

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 29602177 U1	29/08/96	NONE	
NO 301413 B1	05/02/96	NO 942861 A	05/02/96
US 4909459 A	20/03/90	NONE	
US 3953049 A	27/04/76	DE 2410193 A,C	12/09/74
		FR 2220402 A,B	04/10/74
		GB 1460855 A	06/01/77
US 3922034 A	25/11/75	NONE	

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